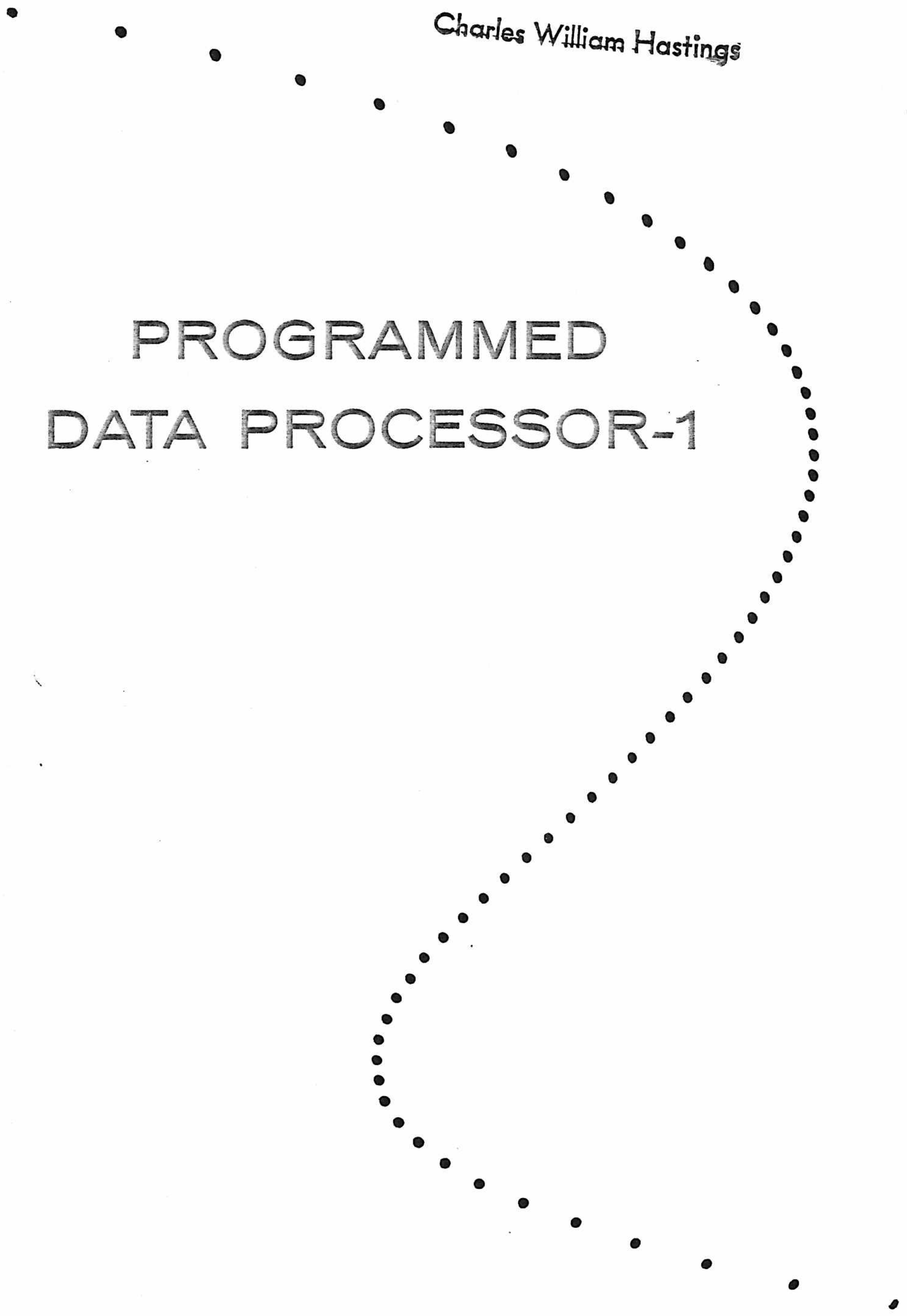
1961

Charles William Hastings

PROGRAMMED DATA PROCESSOR-1



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IV. UTILITY PROGRAMS

The Utility Programs for PDP-1 are designed to provide the nucleus of a growing system of programs. Programs available upon delivery of the machine are:

DECAL PROGRAM (Digital Equipment Compiler, Assembler and Linking Loader Program) is an integrated program for PDP. It incorporates in one system all of the essential features of advanced assemblers, compilers and loaders.

DECAL is both an assembler and compiler which operates in a single pass, combining the one-to-one translation facilities of an assembler and the one-to-many translation facilities of a formula translation compiler. Problem oriented language statements may be freely intermixed with symbolic machine language instructions. The linking loader allows the program location to be specified at load time; subroutines are inserted at load time. The programmer may specify that certain variables and constants are "systems" variables and constants, and the symbols so defined are universally used in a system of many programs. Thus communication between parts of a major program is facilitated, even though these parts may be compiled separately, and storage requirements for a large program are reduced. It is also possible to use block symbols — symbols which may be employed repeatedly within different sections (or blocks) of a program.

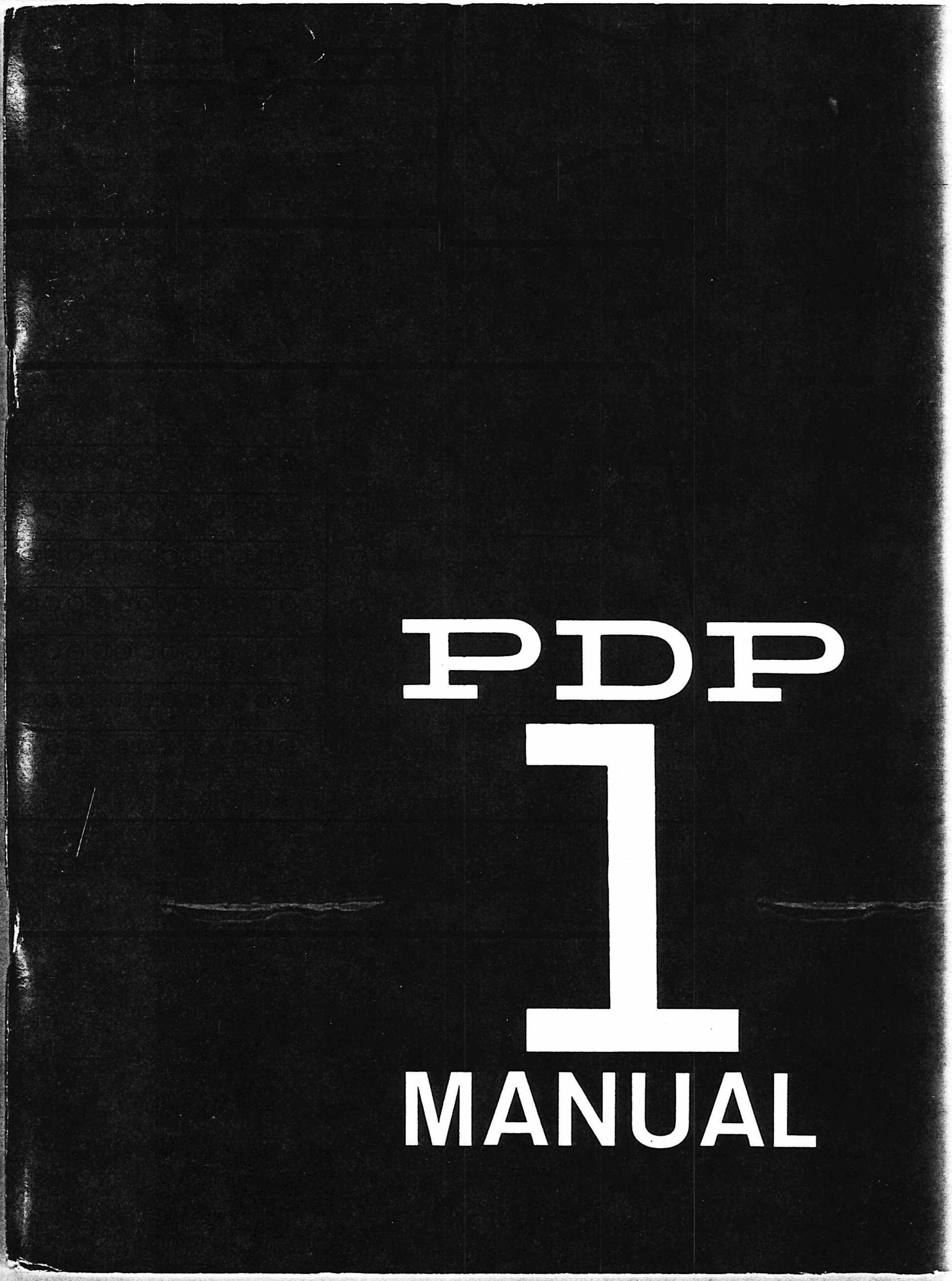
DECAL is an open-ended programming system which can be modified without a detailed understanding of the internal operation by means of a recursive definition facility based on a skeleton compiler with a small set of logical capabilities. The skeleton compiler may act as a bootstrap for introducing more sophisticated facilities.

FLOATING POINT ARITHMETIC is handled by subroutines whose names are permanently stored within DECAL. Each floating point function may be defined to make a PDP-1 look like a machine which has built-in floating point arithmetic. The following commands are used:

Symbol	*Function*	*Symbol*	*Function*
fld x	Load	fdh x	Divide
fst x	Store	fsq	Square root
fad x	Add	ffb n	Floating to binary conversion
fsb x	Subtract	fbf n	Binary to floating conversion
fmp x	Multiply		

Symbol	*Function*	*Symbol*	*Function*
fsn	Sine	fln	Natural logarithm
fcs	Cosine	fbd	Floating binary to floating decimal
fat	Arctangent	fdb	Floating decimal to floating binary
fex	Exponential		

MISCELLANEOUS ROUTINES. A number of additional routines are available. One of the most useful programs is the Typewriter Control Program (TYC). TYC allows the typewriter to be used most effectively as an input-output link by which programs and data are examined and modified. Features of the program include the ability to request the printing of a series of registers and to request a search for various data. Other routines handle arithmetic processes; e.g., number conversions, arithmetic subroutines and oscilloscope character display subroutines.



PDP
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MANUAL

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STANDARD DEC PROGRAM LIBRARY FOR PDP-1

The standard library is designed to provide the nucleus of a growing system of programs and subroutines for the PDP-1. It consists of two broad categories of programs: (1) General and (2) Maintenance, all of which operate with the Standard PDP-1.

GENERAL

MACRO ASSEMBLY PROGRAM.

MACRO is a two-pass assembly program which produces a self-loading, machine language version of a program written in MACRO Symbolic Language. Important features of MACRO include:

Complete macro-instruction facilities with automatic dummy-argument assignment at call-time.

Automatic "constant" and "variable" assignment. Only unique constants are stored.

Symbol assignment printout in alphabetical or numerical order (at programmer option).

Symbol table punchout acceptable by the DDT Program (see below) to allow symbolic debugging.

Informative error printouts.

Automatic repeated assembly of a specified symbolic statement.

Automatic block storage assignment.

Punched block-letter tape labelling.

The MACRO package includes: (1) the Internal Operations Manual with complete, symbolic program listing, (2) the Programming Manual and (3) the necessary symbolic and self-loading machine language tapes.

DDT (DEC DEBUGGING TAPE).

This program is a complete symbolic-octal debugging aid. Its operation is controlled from the typewriter. Its major features are:

Ability to read MACRO generated symbol table tapes to allow completely symbolic debugging.

Examination and modification of the contents of selected memory locations.

Block-search according to specified bits within a specified word.

Printout or punchout of specified areas of memory.

Read and compare tape with memory and printout discrepancies.

EXPENSIVE TYPEWRITER.

Under typewriter control, this program is capable of editing symbolic tapes by reading a tape into its "buffer", accepting additions and corrections, and punching out the amended "buffer" contents. It can perform tape-to-tape, tape-to-typewriter, and typewriter-to-tape translations.

UTILITY PROGRAM GROUP.

This group contains the following programs and subroutines:

Multiply Subroutine for 18-bits.

Divide Subroutine for 18-bits.

RANDOM, a random number generation subroutine for 18-bits.

SINGLEDEC, a single precision floating point package for arithmetic using an 18-bit fraction and an 18-bit exponent.

COPY, a short punched-tape duplicator.

DO, a short "Debug In Octal" routine.

PUNCHDUMP, a punchout routine that saves all non-zero memory.

MAINTENANCE

A complete set of standard test tapes and their description and use is delivered with each PDP-1.